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Poverty transition through targeted programme: the case of Bangladesh Poultry Model

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Abstract

Poverty transition through a capacity development programme called the Bangladesh Poultry Model is assessed using self-assessment dimension in a quasi experiment framework. Current poverty situation is compared with money metric measure. The programme involves longer term intervention towards building the strength of stakeholders such as government department, NGOs, village organisations and women beneficiaries. A number of key questions related to poverty transition through poultry based activities, heterogeneity in livelihood choice and its impact on household welfare, extent of poverty reduction etc. are answered for policy recommendations. Data are drawn from a survey of 400 beneficiary households in 2006; about 50% of them are survivors in the programme. Poverty profiles, transition matrices and regression analysis using asset-base framework are used to analyse data. Results are discussed along with recommendations and policy implications. Adaptation of the programme in several countries is also reviewed briefly using published information to discuss wider implications.

Key words: Bangladesh, Poultry, Poverty, Asset-base Framework

JEL classifications: O3 Q16

1. Introduction

Despite the opportunities for reducing extreme poverty that technological advances have created, the number of poor people in developing countries has fallen only slowly relative to the 1990-92 level, the established MDG baseline period (FAO 2006). Priority of the time is select innovative poverty reduction programmes that help exit from poverty significantly. International communities have been giving increasing emphasis to targeted schemes to mitigate poverty. Bangladesh has made considerable progress in poverty but still it remains pervasive; almost half the population is identified as poor (Kotikula et al. 2007, World Bank 2006). The Bangladesh Poultry Model is an innovative capacity development programme through multi-strategic approaches being adapted widely in a number of developing countries such as Burkina Faso, Benin, Ghana, Eritrea, Malawi, Mozambique, Tanzania, Zimbabwe, Kenya, Senegal, Vietnam, Cambodia, Indonesia, and Nicaragua with donor support from DANIDA, EU, AsDB, IFAD, and the World Bank. Ad hoc experimentation generated the basic dimensions of the model, and these were then reinforced over two decades by research and learning-by-doing experiences with supports from donors and GO-NGO partnership (Akter and Farrington 2007). Household Income and Expenditure Survey data shows that livestock ownership in Bangladesh increased from 32.5% in 2000 to 40.3% in 2005 in Bangladesh and it is higher than average (42.5%) in the bottom 3 deciles (Serajuddin, Zaman and Narayan 2007). Impact studies identified the programme successful in terms of gender mainstreaming and empowerment, higher income, consumption and nutrition; but independent review expressed the view that the results from the weak impact studies should be used with a high degree of caution (Islam and Jabber 2005). Even if the assessment is plausible the following issues are pertinent to poverty reduction.

Firstly, are participants able to raise income or opportunities adequately to quit poverty? It is important to identify strategies leading them out of poverty along with challenges to incorporate in the capacity development programmes.

Secondly, participants are targeted women from poor households. This does not mean they are homogeneous in terms of livelihood diversities. Other livelihoods are external to the model, may be either competitive or complementary to the activities supported by the model. There is a possibility that some of the participants are successfully combining the opportunities generated by the model with exogenous opportunities and moving out of poverty, while the others either have no other opportunities or are failures. It is important to identify such heterogeneities.

Third, it is important to identify how pro-poor initiatives to strengthen common enterprises like poultry keeping in pathways out of poverty could be improved.

The paper addresses these issues and is organised as follows. Following the introduction, section 2 discusses methodology and data, section 3 presents poverty transitions, section 4 explains livelihood strategies and impact on household welfare. The paper concludes in section 6.

2. Methodology

Bangladesh Poultry Model (BPM)

The Bangladesh Poultry Model (BPM) started as a livelihood strategy with the premise that village poultry is a common enterprise of the poor households and so it is possible to reach them easily with any technological intervention through this enterprise (Darudec 2003, Policy and Planning Support Unit, 2003, Dolberg 2003). Reaching the poor with technology is essential to move them out of the vicious circle of poverty.

In 1978 Bangladesh Rural Advancement Committee (BRAC) and Department for Livestock Services (DLS) started a pilot poultry project in Manikganj district, an area with a high proportion of landless people, located immediately west of Dhaka, Bangladesh (Dolberg, Mallorie and Brett 2002). BPM was initiated from this pilot test between 1981 and 1985 by BRAC and DLS. The model was scaled up and modified gradually through large donor funded projects with support from WFP, Danida, IFAD, ADB and the World Bank for a period of more than two decades involving several NGOs such as BRAC, Proshika, Swanirvar Bangladesh and other NGOs registered with the Palli Karma-Sahayak Foundation (PKSF)[1]. Three large donor funded projects that involved improving, expanding and adapting the model were 'Smallholder Livestock Development Project' (SLDP-1, 1993-98), 'Participatory Livestock Development Project' (PLDP, 1997-2002) and SLDP-2 (2001-2006). The 2006-2011 'Agriculture Sector Programme Support' (Phase 2) financed by DANIDA is supporting towards the gradual privatisation of veterinary services, including vaccine production and to Avian Flu prevention and control (Bangladesh 2006).

The model initially comprises a supply chain of 7 enterprises, later simplified to 6 enterprises as in figure 1[2]. SLDP-2 recommended only 2 cadres such as poultry workers and key rearers to be sustainable (Riise et al. 2005). The main idea on the production side was to establish a large number of small household based production units (smallholder poultry farmers) known as the key rearers (KRs) in the model, constituting 95% of the beneficiaries. The remaining 5% were service deliverers who were linked to the KRs in order to ensure input supplies such as vaccination, parent stocks, feed as well as market outlet of the eggs produced[3]. These input suppliers are model breeders (MBs), mini hatcheries, chick rearers, poultry workers, feed sellers and egg sellers. NGOs are contracted to implement the village based activities in collaboration with DLS. MBs producing fertile eggs from crossing Fayoumi hens and Rhode Island Red cocks sell to the small low cost hatcheries producing day old chicks called Sonali[4]. Chick rearers buying Sonali chicks rear up to the age of 2 months to

[1] It was applied in Income Generation for Vulnerable Groups Development (IGVGD) programme, which was a tripartite collaborative venture between Directorate of Relief & Rehabilitation (DRR), Department of Livestock Services (DLS) and BRAC in 1986-1992 (Sarker et. al 2005).

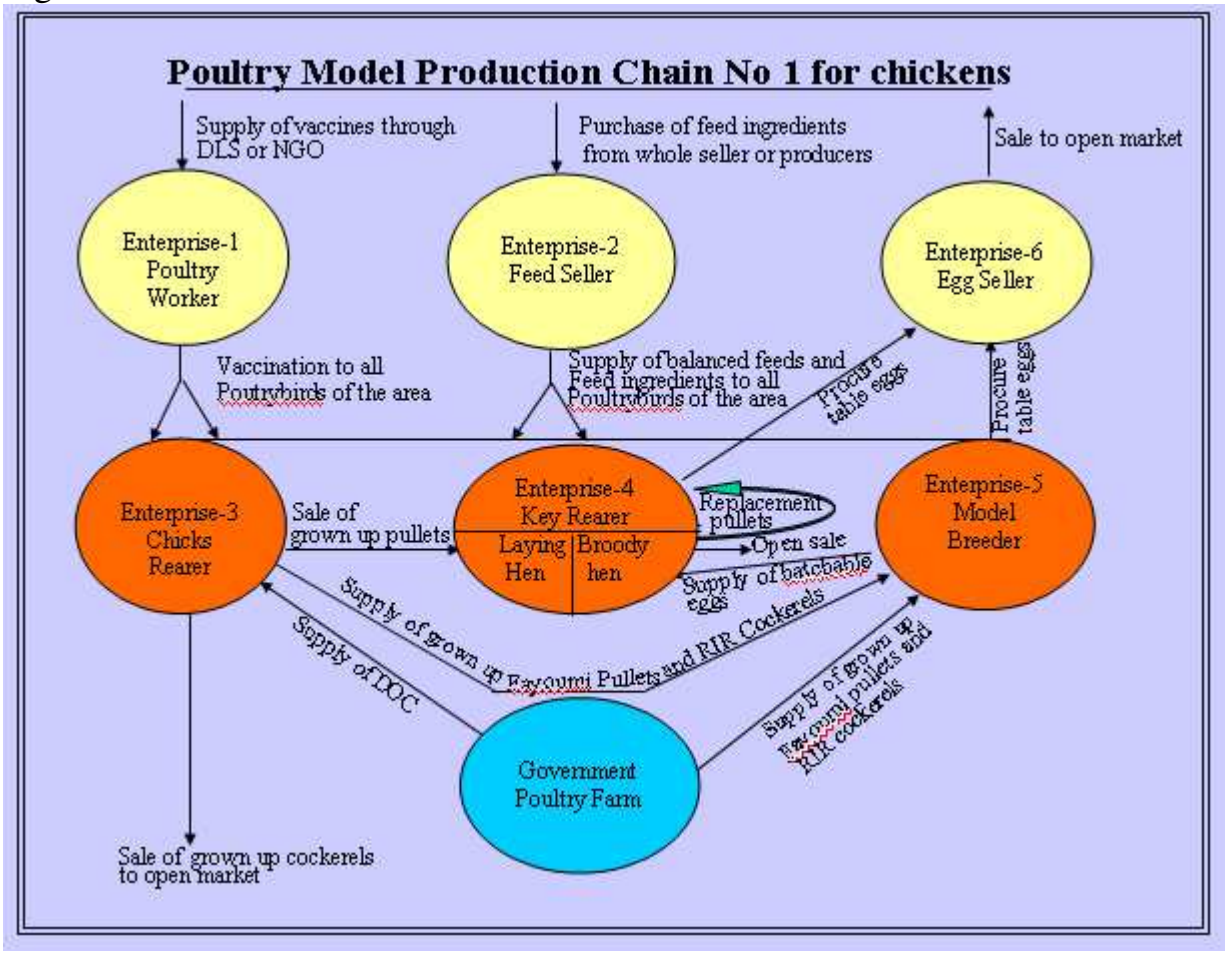
[2] The 7 cadres are key rearers (KRs), model breeders (MBs) , mini hatcheries, chick rearers, poultry workers, feed sellers and egg sellers.

[3] The model started with 4092 beneficiaries comprising 3900 KRs, 26 model breeders, 6 mini hatcheries, 40 chick rearers, 100 poultry workers, 10 feed sellers and 10 egg collectors (Riise et al. 2005).

[4] Sonali is a cross breed of Egyptian Fayoumi hens and American Rhode Island Red cocks. This cross breed has been widely used in smallholder poultry initiatives in Bangladesh, as it is high yielding and copes well in the local environment. Other improved breeds were also experimented.

sell them to the KRs via NGOs. The support services for the KRs are primarily the poultry workers; women trained and equipped to vaccinate poultry against the most common poultry diseases. The vaccine is procured through Veterinary Hospitals or at the local market. Feed sellers procure various feed ingredients available at the local market or supplied by the supporting NGO and sells compound feed or feed ingredients to the poultry keepers. The egg seller is to buy eggs from the producers and sell to the market and is expected to transport fertile eggs from model breeders to the mini hatcheries. The beneficiaries along with KRs are also supported with training and micro-credit. The model was gradually modified from the experience. For example, KRs started with 10-15 birds operating under a semi-scavenging system, later choices were extended to 'case rearers' with 36 or more laying birds in a cage system (Dolberg 2001)[5]. The development pathway of the model comprises several phases of experimentation along with the expanded adoption of the innovated technology country-wide[6].

Figure 1



Source: http://www.fao.org/ag/againfo/subjects/en/infpd/documents/econf_bang/fig1.jpg

[5] At one stage the model allowed the KRs the flexibility to choose additional/alternative production enterprise from the limited number of available technologies such as laying birds (10-15), or chick rearers using day old chicks (200-300), and/or poultry worker.

[6] . At the end of April 1999, NGOs had identified a total of 132,321 beneficiaries against a target of 107,400 for fiscal year 1998-1999. As of April 1999, 22,901 beneficiaries had availed micro credit amounting to Tk 59,977,000.

The BPM may be conceptualised as a holistic capacity building framework that involves longer term intervention towards building the strength of DLS, NGOs and VOs at organisational level[7]. At individual level the poor women improve livelihoods and basic nutrition status as a source of capabilities as emphasised by Sen (2002) and thereby begin a movement out of poverty (Jensen and Dolberg 2003). DLS and NGOs, which have been engaged in the delivery side of capacity-building efforts, have learnt lessons from their experience and that lessons seem well taken by donors to adapt the model not only all over Bangladesh but world-wide. As per the literature of capacity building, what the best approach is, what triggers successful results and what good practice means in this field, are concepts which are still very little understood due to lack of monitoring and evaluation at the organisation level and outcomes of the capacity building usually are considered the result of one time intervention without any follow-up and so not possible to track down (Blagescu and Young 2006). The BPM seems to be a step towards finding a new approach of capacity building overcoming these demerits. For example, the services supplied under the projects 'subject to monitoring and evaluation and replication based on experience' include training, credit, vaccination, exotic poultry birds, feeders and drinkers, feed, hatching receptacles, and housing for birds. These are longer term efforts to improve capabilities of the poor and the pathway takes account of the learning through experience.

Data

Data are drawn from a sample survey of 400 beneficiaries of BPM, 203 of them dropped out from the programme but were still livestock holders in August, 2006 when the survey was carried out. The purposively selected location was in the district of Manikgonj where the initial experiment of the model started. The sample size was pre-determined by financial constraint and so survey coverage was kept limited to the population under two area offices of BRAC. The two selected area offices covered five Unions (45 villages) of Manikgonj Sadar Thana and one Union of Saturia Thana (5 villages)[8]. The sample beneficiaries were selected randomly from the list of member key rearers in the area offices of BRAC. As mentioned earlier, key rearers constitute of about 95% of the participants in the programme and in addition, the model was designed with a central focus on them, assuming that if they survive, other participants would also survive. Data was collected with a structured questionnaire in two weeks during August, 2006 by eight local interviewers who were selected and trained with the help of DLS officers in Dhaka and Manikgonj. Questionnaires were translated into the local language and pre-tested before being made final. The interviewers were intensively supervised and data was checked regularly during field data collection.

Framework for analysis

Dynamic process that lead households to fall into and escape poverty are analysed using poverty transitions (Baulch and McCulloch 1998). In this paper, transition

[7] The development of the concept of smallholder poultry for poverty alleviation targeting women is often termed similar to the concept of multiple sources of innovation model of agricultural research and technology development proposed by Biggs (1989) (Jabbar and Seré 2007).

[8] Thanas are sub-districts and Unions are sub-Thanas. They are administrative units in Bangladesh.

matrices based on recalled self-assessment of poverty by the beneficiary respondents are used for the purpose of examining dynamic aspect and testing hypotheses. This qualitative definition of poverty may produce incidence different from quantitative poverty. The current incidence of self-assessed poverty is compared with income poverty. It is often argued that income/consumption-based definition of poverty has the advantage of clearly dividing a population into mutually exclusive categories however consumption-based definition is usually considered more stable (Lipton and Ravallion 1995). Our data set contains only a cross-section of income data. In order to address whether the model facilitates a particular livelihood strategy we rely on asset-base approach (Siegel 2005, Alwang et al. 2005). This framework assumes that household welfare results from its livelihood strategies determined by its access to assets in the given institutional, policy and vulnerability environment. Some of the assets affect welfare indirectly through livelihood strategies. The relation may be expressed as follows:

(1) $L = f(X, Y)$

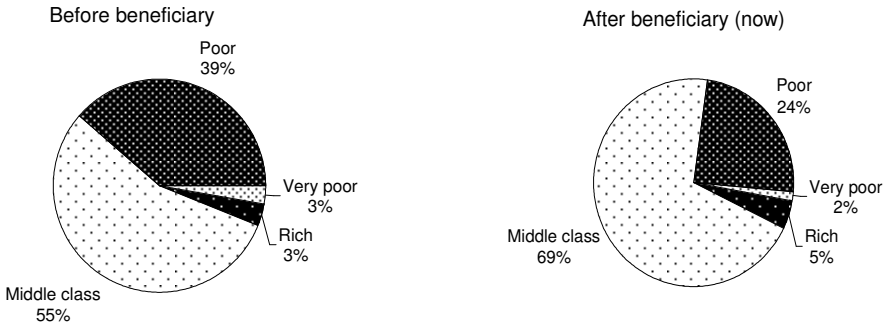
(2) $W = f(X, L)$

Where, L represents the vector of livelihood strategy pursued by households, X is the matrix of assets that affect welfare directly and indirectly, Y is the matrix of assets that affect welfare only directly and W is a vector of welfare measure. We use multinomial logistic regression to explain livestock based livelihood strategies in equation 1. Household welfare is measured by income per person and the equation 2 is estimated using two-stage regression.

3. Poverty transitions

The respondents who were the beneficiary of the BPM were asked to assess their poverty situation in two points in time- prior to their entry into the programme and at the time of interview in August, 2006. Their answers in four categories are depicted in Figure 2 which shows that poverty reduced considerably. Poor and very poor constituted of 42% before they entered into the programme and the proportion dropped down to 26% in 2006. Years of entry varied widely; a quarter of the sample entered the programme during the eighties, more than 60% were beneficiaries in the nineties. So this is not a contrast between two particular years but before-after situation of programme participation. The transition is not due entirely to programme because effects of other sources of development are not separated.

Figure 2.



The transition matrix in Table1 indicates that 67 participants (more than 40% of the poor) escaped poverty partly due to programme and only 3 out of 234 non-poor

households fell into poverty. Thus the risk of entering poverty is only around 1% in presence of a programme.

Table 1: Movement in and out of poverty.

			Status now 2006		Total
			Poor	Non-poor	
Status before	Poor	Count	99	67	166
		% of Total	24.8	16.8	41.5
	Non-poor	Count	3	231	234
		% of Total	0.8	57.8	58.5
Total		Count	102	298	400
		% of Total	25.5	74.5	100.0

Chi-square = 174.08 with 1 df (sig. 0.00).

Off-diagonal entries add up 17.6% with 16.8% moving upward and 0.8% downward. The downward movement is considerably less than overall transition measured by quantitative poverty in developing countries (Baulch and Hoddinott 2000)[9]. Statistically, before-after poverty situation is significantly different.

Downward mobility is in fact nil among the households which remained active in the programme until 2006 (Table 2). This surely indicates a positive contribution of the programme toward poverty reduction.

Table 2: Movement in and out of poverty by beneficiary status.

Participation status	Poverty status			Status now 2006		Total
				Poor	Non-poor	Poor
Active	Status before	Poor	Count	33	47	80
			% of Total	16.8	23.9	40.6
		Non-poor	Count	0	117	117
			% of Total	.0	59.4	59.4
	Total		Count	33	164	197
			% of Total	16.8	83.2	100.0
Dropout	Status before	Poor	Count	66	20	86
			% of Total	32.5	9.9	42.4
		Non-poor	Count	3	114	117
			% of Total	1.5	56.2	57.6
	Total		Count	69	134	203
			% of Total	34.0	66.0	100.0

4. Livelihood strategies and welfare

Although poultry enterprise alone is being provided with support, households pursue heterogeneous livelihood strategies. Mean level of income share from poultry was

[9] Self-assessed poverty and income/consumption poverty are not directly comparable.

only 5.7% with a standard deviation of 11.7%, while mean level of income share from livestock as a whole (including poultry) was about 16.2% with a standard deviation of 23.5%. Only 10% of the households considered livestock as a major source of income (having 50% or more of income share).

Table 3 identifies 5 dominant strategies from the recorded 28 activities, identified on the basis of income share[10]. Qualitative self-assessed poverty declined through all these routes, but the decline is very little through wage labour route. Quantitative income poverty appears much higher than self-assessment except for those who are in regular employment in government and private organisations. Overall, the difference between qualitative and quantitative measurement is statistically significant at less than 1% and 5% respectively for upper and lower poverty lines. Thus hardcore poverty measured by lower poverty line is closer to self-assessed poverty; the difference is not significant at 1% but at 5%. We further examined the cross-tabulation between self-assessed poverty and quantitative measurement and observed that 62% of the self-assessments matched with lower poverty line measurement and 52% of the answers matched with the upper poverty line measurement.

Table 3: Poverty status by main source of livelihood.

Livestock based livelihood strategies*	N	% N	Annual income per person (Tk)	Self-assessed Poverty before %	Self-assessed Poverty now %	Income poverty upper ** %	Income poverty lower ** %
#1. Agriculture includes livestock	85	21.3	14888	42.4	24.7	35.3	30.6
#2. Livestock plus business/skilled service	125	31.3	11483	36.0	26.4	56.8	47.2
#3. Livestock plus regular job	62	15.5	17933	48.4	21.0	21.0	12.9
#4. Livestock plus wage labour	39	9.8	9587	53.8	46.2	66.7	51.3
#5. Livestock plus other non-farm (includes international migration) jobs	89	22.3	21434	38.2	19.1	31.5	22.5
Total	400	100.0	15204	41.5	25.5	42.0	33.3

*#1. Either 50% of household income is derived from livestock or 60% of income is derived from agriculture plus livestock, #2. Either 60% of income is derived from livestock plus business or 60% of income is derived from livestock plus skilled services, #3. 60% of income is from livestock plus regular job, #4. 60% of income is derived from livestock plus wage labour, and #5. 60% of income is derived from multifarious non-farm activities include 26 international migrants contributing from a minimum of 48% of family income share.

**Upper poverty line is Tk 893 per person per month, and lower poverty line is Tk 772 per person per month, Tk is Bangladesh currency Taka. They are based on the Report of the Households Income and Expenditure Survey 2005 (pages 160 and 161) data on Dhaka rural poverty lines upper and lower (cost of basic needs approach), composite price index and food price index respectively (BBS 2007). Poverty based on upper poverty line is called absolute poverty and that based on lower poverty line is called hardcore poverty in Bangladesh.

When we compare the routes of livelihoods in terms of annual per person income, international migration combined with other non-farm activities (#5) appears the best, followed by regular job (#3). Agriculture (#1) is in the third position among the five

[10] Strategies are defined in Table 3 note.

categories. The crude probability of access to international migration was 6.5% and that of regular job was 23.5%.

Programme includes training, credit, information, veterinary services etc. It is important to identify whether they contribute to the choice of any of the livelihoods. To examine this we estimate equation (1) of asset-base framework using multinomial logistic regression. Asset variables included in the model are human capital such as education, household size and composition, age and training; natural capital such as land and its quality; financial capital such as credit; physical capital such as business assets, agricultural machineries; and social capital such as membership in the programme and other organisations, etc. Market access and location variables are also included in the model. The results are presented in Table 4. Statistically, model fit is acceptable. Most of the results appear plausible. Definition of the variables along with their mean and standard deviation are reported in Table A1 in the appendix. Significant results are interpreted below.

Family education is a significant determinant of regular job based livelihood; the more educated the family members the more they prefer regular job. An extra year of median level of schooling of seven plus members in the household causes 1.3 times higher probability of choosing a regular job than agriculture.

Households with higher dependency burden are associated less with wage labour. They are more likely to choose agriculture and/or livestock as a major source of livelihood than wage labour indicating that extra burden cannot be met with the low paid wage labour income, instead dependent members could help raising extra unit of livestock or could add extra unit value to agriculture and livestock. A households having extra adult has a better chance of getting a regular job and less likely to enter wage labour than agriculture with livestock. The likelihood of all non-farm occupations except regular job is higher for larger families. Effective training in poultry related activities reduces the likelihood of diversifying through non-farm activities.

Land ownership is negatively associated with all non-farm routes but none is significant at 5% level, only other category #5 is significant at 10%. In absence of soil quality data, productivity of land in terms of log of per acre net income was used as a proxy of land quality (it also includes other effects such as technology). This variable is highly significantly negatively associated with three of the four non-farm routes. This means that households are likely to stay with agriculture and livestock rather than moving to non-farm occupations if better quality land and/or better technology are available. Also, the likelihood of choosing agriculture is double or almost double the all other routes with the increase in livestock asset by 1%. If the beneficiary woman is single (unmarried or widow or divorces) the likelihood of non-farm livelihood is much higher than agriculture. Longer stay with the programme is negatively associated with regular job, other non-farm job and international migration.

Table 4. Multinomial logit model (Livelihood strategy #1 Agriculture includes livestock as comparison group.

	#2 Livestock plus business/ skilled service				#3 Livestock plus regular job				#4 Livestock plus wage labour				#5 Livestock plus other non-farm (with international migration) jobs			
	Co-efficient	Std. Error	Sig.	Odds ratio	Co-efficient	Std. Error	Sig.	Odds ratio	Co-efficient	Std. Error	Sig.	Odds ratio	Co-efficient	Std. Error	Sig.	Odds ratio
Intercept	6.177	1.702	.00		2.207	2.882	.44		2.065	2.440	.40		5.418	1.749	.00	
ed1	-.019	.106	.85	.98	.263	.147	.07	1.30	-.137	.166	.41	.87	.022	.103	.83	1.02
edu	.072	.101	.47	1.07	-.164	.146	.26	.85	.021	.163	.90	1.02	-.070	.101	.49	.93
deprat	-1.466	1.212	.23	.23	2.968	2.178	.17	19.45	-3.742	1.884	.05	.02	-2.110	1.277	.10	.12
adult	-.150	.659	.82	.86	1.689	1.008	.09	5.42	-1.990	1.072	.06	.14	-.052	.668	.94	.95
famS	.943	.523	.07	2.57	-1.222	.858	.15	.29	2.224	.833	.01	9.24	.894	.537	.10	2.44
Age	-.034	.022	.12	.97	-.017	.035	.62	.98	-.027	.036	.47	.97	-.027	.023	.24	.97
fhead	-1.097	1.403	.43	.33	-2.576	1.840	.16	.08	-2.210	1.793	.22	.11	-1.802	1.384	.19	.16
D11	-1.453	.767	.06	.23	-1.618	1.595	.31	.20	-1.481	1.223	.23	.23	-2.119	.906	.02	.12
Farm	-.404	.361	.26	.67	-.771	.560	.17	.46	-.771	.649	.23	.46	-.610	.343	.08	.54
lnyield	-.260	.051	.00	.77	-.020	.085	.82	.98	-.308	.099	.00	.73	-.137	.048	.00	.87
credit	.087	.518	.87	1.09	-.868	.940	.36	.42	1.757	.987	.08	5.79	.195	.534	.71	1.22
lnBasset	-.059	.056	.30	.94	.005	.093	.95	1.01	-.013	.077	.86	.99	.069	.054	.20	1.07
lnlstk	-.730	.127	.00	.48	-.654	.173	.00	.52	-.466	.167	.01	.63	-.675	.131	.00	.51
distmkt	-.135	.309	.66	.87	-.736	.497	.14	.48	-.071	.396	.86	.93	.097	.313	.76	1.10
distroad	.135	.223	.55	1.14	-.451	.429	.29	.64	.374	.292	.20	1.45	-.036	.240	.88	.96
D1	1.582	1.356	.24	4.86	4.062	1.709	.02	58.07	2.883	1.534	.06	17.86	2.828	1.334	.03	16.91
tlength	.004	.036	.91	1.00	-.114	.064	.07	.89	-.002	.050	.97	1.00	-.062	.037	.10	.94
infoS	.254	.443	.57	1.29	-.618	.728	.40	.54	.320	.610	.60	1.38	.130	.456	.78	1.14
Model fit	Mean pred. prob.=0.313		% of correct pred.=76.8		Mean pred. prob.=0.154		% of correct pred.=88.7		Mean pred. prob.=0.098		% of correct pred.=51.3		Mean pred. prob.=0.221		% of correct pred.=35.2	

Pseudo R square (Cox and Snell) = 0.748, Likelihood ratio Chi Square = 549.38 (sig = 0.00).

Determinants of income

Table 5 presents the regression results of equation 2. Dependent variable is the log of per person annual income as a measure of household welfare. Strategy variables are not highly significant. Strategy #2 is significant at 10% and strategy #5 is significant at 5%. Within each strategy, some jobs were better than others. So we introduced some dummy variables in the model. Whether earning a major income or not, those who are engaged in regular salaried jobs are significantly better than strategy #1 and strategy #3. Strategy #5, livestock plus other non-farm activities produces lower welfare than agriculture along with livestock but international migration produces significantly higher income than agriculture and livestock.

Table 5. Determinants of income of beneficiary households, Bangladesh, 2006.

Variables	Co-efficient	Standard error	z statistic	Sig.
(Constant)	9.251	.243	38.079	.000
#2 Livestock plus business	-.158	.091	-1.740	.083
#3 Livestock plus regular job	-.199	.146	-1.360	.175
D10 (regular job = 1)	.433	.124	3.481	.001
#4 Livestock plus wage labour	-.063	.156	-.401	.689
nonaglD (non-farm wage labour)	.020	.123	.164	.870
#5 Livestock plus other	-.224	.109	-2.050	.041
D3 (have international migrant = 1)	1.067	.110	9.665	.000
ed1 (med. Yrs of schooling)	.028	.011	2.652	.008
depart (dependency)	.023	.147	.155	.877
Adultm (adult male)	.176	.081	2.174	.030
Adultf (adult female)	.098	.087	1.132	.258
famS (family size)	-.223	.064	-3.461	.001
Age_median of working members	-.005	.003	-1.848	.065
fhead (female head)	-.014	.107	-.131	.896
D11 (training/information)	.068	.123	.557	.578
Farm size (own land acres)	.160	.077	2.067	.039
Land rented (acres)	.276	.077	3.570	.000
Credit (access to credit=1)	.155	.068	2.284	.023
lntree (tree asset value in log)	.003	.007	.393	.695
lnBasset (business asset value log)	.020	.008	2.584	.010
lnDurab (durable asset value log)	.015	.007	2.259	.024
Lnlstk (livestock asset value log)	.010	.014	.722	.471
Distance from market (km)	.054	.045	1.202	.230
Distance from metallic road (km)	-.001	.034	-.039	.969
Length of time (yrs)	-.007	.005	-1.506	.133
Active = 1	.047	.059	.795	.427
D12 (land<=0.5 acres = 1)	.074	.109	.678	.498
Location 2	.368	.084	4.388	.000
Location 3	.281	.107	2.623	.009
Location 4	.046	.142	.322	.748
Location 5	.103	.118	.875	.382
Location 6	-.238	.110	-2.166	.031

Dependent Variable: log of annual income per person, $R^2 = 0.544$

An additional year of schooling leads to 2.8% increase in well being. Households with an extra adult male are better off. An additional member in the household causes a decrease in welfare by 22.3%. The effect of age is not significant at 5% but at 10%. Land owned and rented in as well as credit, all have strong positive effect on household well-being. Business and durable assets are significantly and positively associated with welfare.

5. Broader implications

Parallel Models world-wide and prospects for improvement

The model was adapted in a number of other developing countries such as Burkina Faso, Benin, Mozambique, Ghana, Eritrea, Tanzania, Zimbabwe, Kenya, Senegal, Vietnam, Cambodia, and Nicaragua with donor support from DANIDA, EU, AsDB, IFAD, and the World Bank. Several smallholder poultry development projects evolved in parallel with the Bangladesh model, not replications, in Cameroon, China, Egypt, Indonesia, Lesotho, Malawi, Nepal, Pakistan and Sri Lanka in the 1980s and 1990s. These projects though not replications of the Bangladesh semi-scavenging model *per se*, but it is likely that some lessons from the early experiences of the Bangladesh model were used in the design of these projects**.** These projects vary in size, composition and organizational mechanism for implementation; however all are targeted to the poor, especially women. An analysis of 12 projects in nine countries by IFAD show that eight projects support semi-intensive system based on confinement or semi confinement, and three support scavenging system. These projects promote exotic/improved breeds or local breeds. In five projects, poultry and eggs are sold within the project areas, and in three cases outside the project areas. With regard to the remaining four projects, there was either no information available, or the intervention was not directly related to marketing. Among the types of support provided for poultry development, 10 projects provided credit support, 7 provided support for veterinary services, a project in Egypt provided facilities for the production of the pathogen-free eggs that are used for the production of Newcastle Disease vaccine. This project also provided beneficiaries with improved and vaccinated day-old chicks (Nabeta, 2002; Islam and Jabbar, 2003). These activities enable farmers with skills of using and adapting new technologies.

Institutional development

From the experience of poultry projects, the Royal Veterinary and Agricultural University (KVL) in Denmark established the Network for Smallholder Poultry Development in 1996 with Danida funding. Activities since the start of the Network have contributed towards the building up of resource bases and institutional capacity related to village poultry production in the Danida programme countries and in Denmark. This Network has been coordinating and implementing poultry projects in many countries, developing databases and organising workshops and seminars. A comprehensive communication and networking system has been developed and utilised for exchange of information and ideas. This includes a well-visited Internet homepage with relevant links. Activity reports of the Network with valuable information are being made available in the internet by its Coordination Unit.

Research and education

With the help of the Network, scholars of the developing countries have been participating in vocational training, MSc and PhD programmes, strengthening the research activities in home countries to develop technologies and solve poultry related problems. For example, a two-year MSc programme in Rural Poultry Production and Health started in 2000 helped scholars from Bangladesh, Malawi, Zimbabwe and other countries to conduct research in own country environment[11].

6. Conclusions and Implications:

In order to help exit from poverty, international communities have been giving increasing emphasis to targeted schemes. The Bangladesh Poultry Model is a unique example of such effort that was developed as an integrated supply chain gradually through learning on the basis of experience from donor-funded GO-NGO partnership projects for a period of more than two decades. This study is based on primary data collected with a structured questionnaire from a sample of 400 beneficiary smallholder poultry farmers. Poverty transition was assessed using self-assessment dimension in a quasi experiment framework. Current poverty situation was compared with money metric measure. Asset-base approach was used to address whether the model facilitates a particular livelihood strategy to move out of poverty. Multinomial logistic regression was used to explain livestock based livelihood strategies. Household welfare measured by income per person was estimated using two-stage regression. The important conclusions are:

The qualitative tool of self-assessment shows a marked reduction in poverty due to the targeted poultry programme, from a head-count incidence of 42% to 26%. This transition occurred in a long period starting from more than two decades to until recently. Poverty incidence of households which are still active in the programme is reduced to 16.8%. This change is not due entirely to programme because exogenous environment is not controlled. The quantitative measurement of poverty using income data collected from the same cohort of population produced a higher estimate of current incidence of poverty; 42% according to upper poverty line (absolute poverty) and 33.3% by lower poverty line (hardcore poverty).

Livelihood strategies are heterogeneous, although poultry enterprise alone is being supported with technology, training, information, vaccination etc. Mean level of income share from poultry was only 5.7% with a standard deviation of 11.7%, while mean level of income share from livestock as a whole (including poultry) was about 16.2% with a standard deviation of 23.5%. Only 10% of the households considered livestock as a major source of income (having 50% or more of income share).

Diversification through access to international migration, regular jobs in public and private sectors and other non-farm occupations are different options for better coping with poverty. About 24% of the households have access to regular job and 6.5% have access to international migration. Diversification through wage labour employment

[11] Link of the publications is http//www.poultry.life.ku.dk/

(also known as day labour) in agriculture and non-agriculture appears the worst form of livelihood for this sample of poorer households. Livestock in crop agriculture appears better than raising livestock in households which have self-employment in non-agriculture such as small business.

Access to education is a significant determinant of regular job and better non-farm opportunities including international migration. Access to credit through the programme helps to diversify with business and non-farm self-employment activities but not statistically significant except that it is significant at 10% for wage employment. It may indicate repayment pressure and low productivity of loan given for poultry enterprise.

The following implications are pertinent:

There should be no doubt that poverty mitigation efforts like the Bangladesh Poultry Model could reduce poverty incidence but the positive impact on welfare is much less than impact evaluation studies estimate using qualitative measurement of income, empowerment etc. Impact on welfare could have been much higher if some of the supports were being made more flexible to choose a complementary livelihood or another livelihood of their choice. For example training appeared a significant determinant of livelihood choice. All 400 women of the sample were given training on poultry related activities, but everybody is not interested in poultry and most of them considered training ineffective because they were not interested in it. They might enter into the training due to lack of alternative opportunities. Many poultry farmers keep other livestock in addition to poultry, training may be extended to other livestock farming.

Regular job and international migration are better routes out of poverty. As it is possible to reach world wide through poultry enterprise, circulation of job and migration related information could improve household access to other jobs while some members are still involved in poultry production. Information package, alternative training opportunities and education opportunities could be used as incentives to improve productivity of poultry farming. The budget may partly be managed by curtailing training to poorly performing poultry farmers.

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Appendix

Table A1: Description of the variables with its mean and standard deviation

Variable description	Mean	Std. Deviation
ed1, Median years of schooling of household members > 7 yrs of age	5.32	2.87
edu, Education of beneficiary women (yrs of schooling)	4.08	3.07
depart , dependency ratio = no of persons (below 15 and above 60)/no of persons (15-60 years of age)	.49	.44
adult , no of persons 15+ years	3.08	1.37
adultm, no of males 15+ years	1.62	.94
adultf, no of females 15+ years	1.46	.71
famS, family size	4.17	1.54
Age_median, median age of family workers in the family	36.98	10.36
fhead, beneficiary female who is also head of the family	.08	.28
D11, beneficiary gained from training, accessed to information/knowledge	.05	.22
Farm size (own land acres)	.40	.61
lnyield, productivity of land (revenue per acre in Tk) in log	2.59	4.45
credit, access to micro credit = 1	.80	.40
lnBasset, value of business assets (Tk) in log	2.05	3.64
lnlstk, value of livestock asset (Tk) in log	7.85	2.18
Distance from market (km)	1.03	.83
Distance from metallic road (km)	.62	1.05
D1, marital status of beneficiary women (single=1)	.13	.33
D3 , households having international migrant member	.07	.25
D10 , households having member with regular job	.24	.43
D8, households sold livestock due to shock reasons	.22	.41
Length of time (yrs) in the programme	9.74	6.23
nonagID, households having non-farm wage labour	.10	.30
infoS, households having membership with more than one organisations	.52	.50
Active = 1, who are still active in the programme	.49	.50
D12, households who fulfil targeting criteria of land<=0.5 acres	.78	.42
Gpara, location dummy	.35	.48
Tilli, location dummy	.13	.34
Jagir, location dummy	.05	.21
Nobo, location dummy	.07	.25
Dighi, location dummy	.07	.25
Valid N (listwise) = 400		